

SGT-Inc.

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Subject: ADC1175 TID test report

## 1. Summary of results

The Integral Non Linearity is significantly degraded on one part (SN6) after 10 krad. Four parts have a power supply bias current out of specification limits after 19 krad. All parts are functional up to the maximum test dose level of 48 krad.

## 2. Tested device

Tested devices are described in Table 1. The test samples are coming from the ST5 flight lot.

<b>Part type</b>	ADC1175CIMTC
<b>Manufacturer</b>	National Semiconductors
<b>Function</b>	8 bit, 20 MHz, 60 mW ADC
<b>Package</b>	TSSOP 24
<b>Package marking</b>	N EM04AB ADC1175CIMTC
<b>Number of parts</b>	10 (8 irradiated parts + 2 control part)

Table 1: Test samples

## 3. Irradiation conditions

The parts have been irradiated with the NASA-GSFC Co60 source. Irradiation steps are described in Table 2.

	Dose Rate (rad/hour)	Step dose (krad)	Total accumulated dose (krad)
Irradiation step 1	154	2.5	2.5
Irradiation step 2	504	2	4.5
Irradiation step 3	300	5.4	9.9
Irradiation step 4	1190	6	15.9
Irradiation step 5	720	11.5	27.4
Irradiation step 6	899	20.8	48.2

Table 2: Irradiation test sequence.

## 4. Bias conditions

Eight parts were irradiated with a dynamic bias as described Table 3. This bias condition corresponds to the conversion of a 0/5V 4 MHz sinus signal with a clock frequency of 20 MHz.

Pin #	Pin name	Bias
1	OE/	GND
2	DVSS	GND
3	D0 (LSB)	NC
4	D1	NC
5	D2	NC
6	D3	NC
7	D4	NC
8	D5	NC
9	D6	NC
10	D7 (MSB)	NC
11	DVDD	+5V DC
12	CLK	20 MHz squarewave signal
13	DVDD	+5V DC
14	AVDD	+5V DC
15	AVDD	+5V DC
16	VRTS	NC
17	VRT	+5V DC
18	AVDD	+5V DC
19	VIN	0/5V 4 MHz sinus signal
20	AVSS	GND
21	AVSS	GND
22	VRBS	NC
23	VRB	GND
24	DVSS	GND, connected to AVSS

Table 3: Bias conditions during irradiation

## 5. Electrical measurements

The parameters measured, as well as the test conditions, are described in Table 4.

$AV_{DD}=DV_{DD}=5V$ ,  $OE/=0V$ ,  $V_{RT}=2.6V$ ,  $V_{RB}=0.6V$ ,  $C_L=20$  pF,  $f_{CLK}=20$  MHz at 50% duty cycle

Parameter	Symbol	Test condition	Limit		Unit
			min	max	
Functional test		$f_{CLK}=20MHz$			
Total Operating Current	$IAV_{DD}+I_{DV_{DD}}$	$DV_{DD}=AV_{DD}=5.25V$ , $f_{CLK}=20MHz$		17	mA
Integral Non Linearity	INL	$f_{CLK}=20MHz$		+/-1.3	LSB

Table 4: Electrical measurements

## 6. Test results

Tables 5 to 8 show the electrical measurements performed after each irradiation step for each irradiated part. Fig 1, 2, and 3 show the plot of the variation versus dose of the power supply current and the integral non linearity

Dose (krad)	0	3	5	10	16	27	48
SN1	pass	pass	pass	pass	pass	pass	pass
SN2	pass	pass	pass	pass	pass	pass	pass
SN3	pass	pass	pass	pass	pass	pass	pass
SN4	pass	pass	pass	pass	pass	pass	pass
SN5	pass	pass	pass	pass	pass	pass	pass
SN6	pass	pass	pass	pass	pass	pass	pass
SN7	pass	pass	pass	pass	pass	pass	pass
SN8	pass	pass	pass	pass	pass	pass	pass

Table 5: Functional test results

Dose (krad)	0	3	5	10	16	27	48
SN1	13.4	13.4	13.3	13.5	14.2	20.9	30.7
SN2	13.4	13.4	13.3	13.4	14.4	23.7	33.0
SN3	13.4	13.4	13.4	13.5	14.2	20.3	29.1
SN4	13.4	13.4	13.3	13.5	14.2	21.0	31.4
SN5	13.4	13.4	14.0	14.1	14.5	18.1	23.6
SN6	13.4	13.4	13.6	22.0	14.8	24.9	32.7
SN7	13.4	13.4	13.5	13.6	14.6	23.2	33.0
SN8	13.4	13.4	13.5	13.6	14.8	24.0	33.9

Table 6: power supply measurements in mA

Dose (krad)	0	2	5	10	16	27	48
SN1	3.41	2.97	2.83	2.26	2.8	2.29	1.7
SN2	1.6	0.01	1.13	1.27	1.31	3.78	2.96
SN3	2.28	3.63	3.81	2.26	2.51	2.29	2.43
SN4	3.64	2.73		1.28	0.99	2.8	1.93
SN5	2.47	4.07	3.26	3.7	3.26	2.8	7.7
SN6	1.24	1.28	3.3		8.3	8.8	20.2
SN7	2.7	2.6	2.8	3.2	3.7	2.8	2
SN8	3.8	3.2	3.3	3.7	3	2.3	2.5

Table 7: Integral Non Linearity results DNL+ in LSB

Dose (krad)	0	2	5	10	16	27	48
SN1	-0.86	-1.93	-1.38	-1.19	-1.3	-1.23	-1.83
SN2	-1.96	-0.01	-1.24	-2.04	-1.3	-1.03	-1.96
SN3	-1.88	-0.59	-2.39	-0.69	-0.75	-1.23	-1.02
SN4	-1.72	-1.24	-2.01	-1.15	-1.75	-1.36	-1.9
SN5	-4.37	-0.8	-1.5	-1.28	-1.13	-0.9	-7.8
SN6	-1.32	-0.7	-2.8		-5.6	-16.3	-21.6
SN7	-1.7	-1.4	-1.1	-1.3	-0.6	-1.4	-1.3
SN8	-1.7	-1.1	-1.8	-0.9	-2.3	-2.1	-1

Table 8: Integral Non Linearity results DNL- in LSB

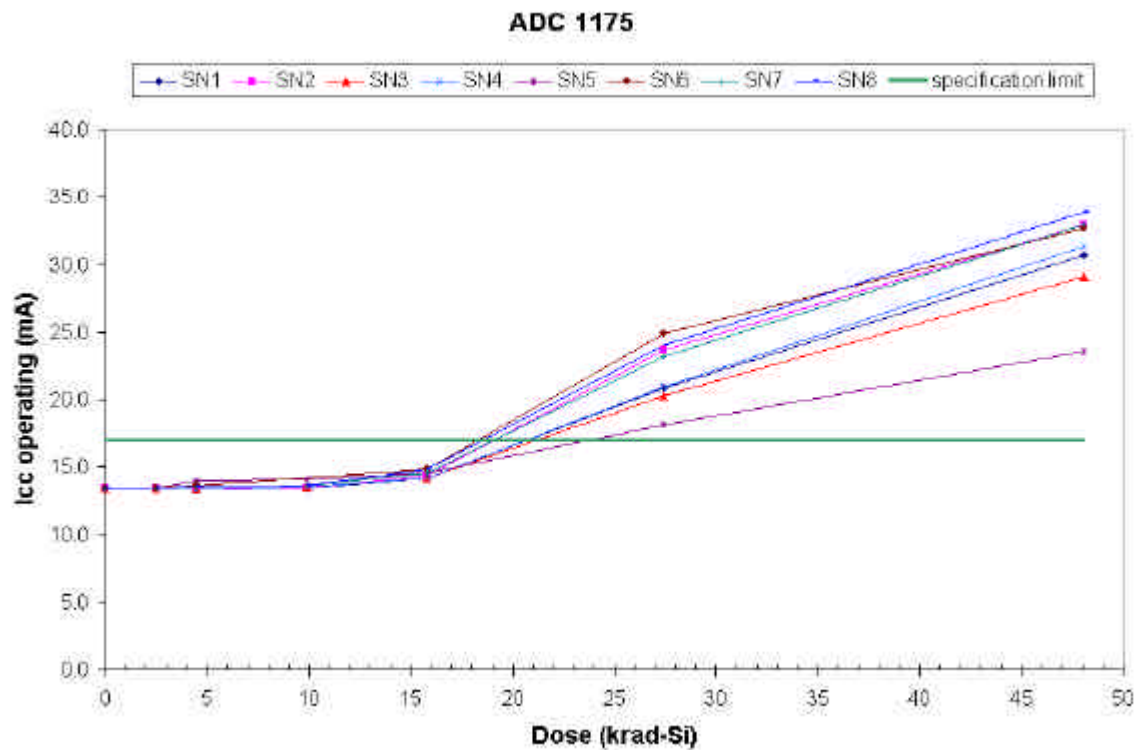


Fig 1: variation of power supply current with dose.

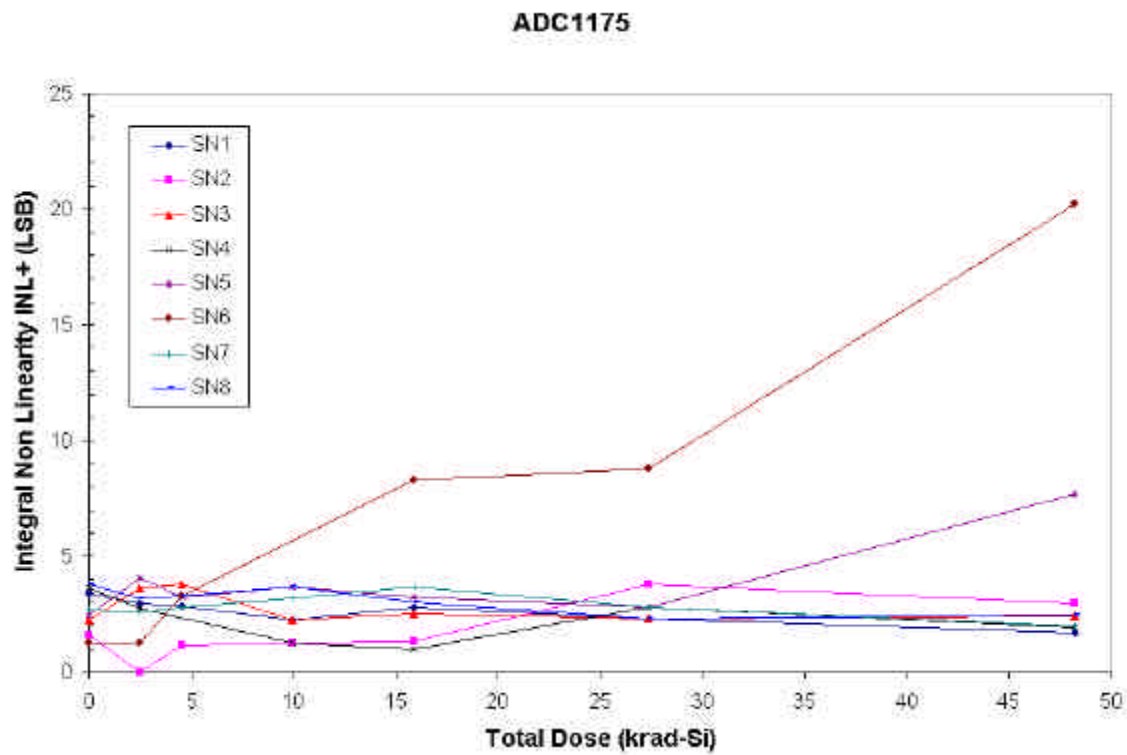


Fig 2: variation of integral non linearity with dose, INL+.

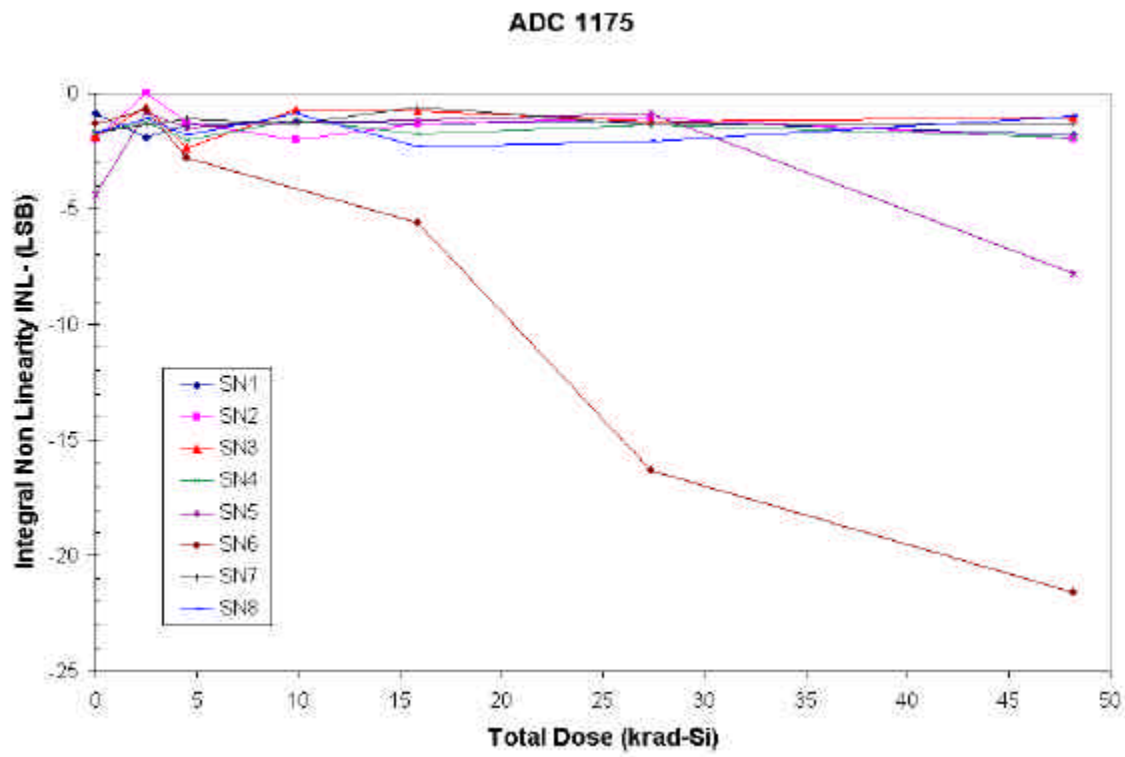


Fig 3: variation of integral non linearity with dose, INL-.